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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/526,785

03/04/2005

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NREL 02-01

7892

7590

09/19/2007

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EXAMINER

SONG, MATTHEW J

ART UNIT

PAPER NUMBER

1722

MAIL DATE

DELIVERY MODE

09/19/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/526,785	Applicant(s) WANLASS ET AL.	
	Examiner Matthew J. Song	Art Unit 1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>6/27/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 26 and 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 26 recites, “the buffer layer is a compositional overshoot which compensates for residual strain in the buffer layer such that the lattice constant in a growth plane matches that of the relaxed lattice constant of both the intermediate region and the active layer” in lines 1-4. The original disclosure does not provide any support for this claim on page 3 of the specification, as alleged by applicant. There is no discussion in the specification and the drawings fail to provide the support for the language of the instantly claimed limitations. The original specification merely discusses optimum alloy compositions and does not use the term “compositional overshoot”. The same arguments apply to claim 30.

3. Claims 1-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that

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the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 recites, “a relaxed intermediate region” in line 6. There is no support for “relaxed”. The specification merely teaches the displacement layer is “lattice matched”. Lattice matching to the active layer does not necessarily mean the layer is “relaxed” because the layer is not lattice matched to the underlying buffer layer. Independent claim 13, also recites the same limitation, and claims 2-12 and 14-30 depend from independent claims 1 and 13.

Claim Objections

4. Claims 26 and 30 are objected to because of the following informalities: Claim 26 recites a growth “plain” in line 3, however the proper word should be “plane”. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-25 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest et al (US 5,518,934) in view of Dries et al (US 6,229,152).

Referring to claims 1 and 13, Forrest et al discloses a InP substrate, a compositionally graded step-graded region **21, 23, 25** terminated by a buffer layer **17**; an intermediate region **27, 29, 19**; a $\text{In}_{0.7}\text{Ga}_{0.3}\text{As}$ layer **11** deposited on the buffer layer, this clearly suggests applicant's active layer because Forrest et al teaches the same material as applicant; and a capping layer **Z, 31** (Fig 1B, 5A, 6 and col 3, ln 1-40 and col 7, ln 25-30).

Forrest et al does not teach the intermediate region is relaxed.

In a method of forming a InGaAs detector devices, note entire reference, Dries et al teaches lattice mismatched InGaAs layers, when grown on buffer layers of relaxed InAsP, results in detectors with acceptable dark currents and high bandwidth (col 1, ln 25-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Forrest et al by using a relaxed InAsP buffer layer for layers **19, 29, 27** for the lattice mismatched InGaAs layer **13** to produce a detector with acceptable dark currents and high bandwidth (col 1, ln 25-65).

Referring to claims 2, 14, 25 and 29, the combination of Forrest et al and Dries et al teaches an InP substrate (col 3, ln 1-10), which is a semi-insulating material.

Referring to claims 3 and 15, the combination of Forrest et al and Dries et al teaches a step graded InAsP buffer layers (col 3, ln 1-15).

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Referring to claims 4 and 16, the combination of Forrest et al and Dries et al teaches a step graded buffer with a InP layer, InAs_{0.1}P_{0.9} layer, InAs_{0.2}P_{0.8} layer, InAs_{0.3}P_{0.7} layer, this clearly suggests applicant's graded region is varied incrementally to accommodate the lattice mismatch between layers 9, 11 and 13 (col 3, ln 1-15).

Referring to claims 5-6 and 17-18, the combination of Forrest et al and Dries et al teaches a InAs_{0.3}P_{0.7} buffer layer having a thickness of 1 μm (Fig 1B), wherein the layer is expected to be strained because the layer is between two lattice mismatched layers and lattice mismatch leads to strained layers. This concept of lattice mismatch result in a strained layer is evidenced by Wieczorek et al (US 6,812,074), which teaches a slight lattice mismatch leads to a strain in a layer (col 5, ln 25-35).

Referring to claims 7-8 and 19-20, the combination of Forrest et al and Dries et al teaches a In_{0.7}Ga_{0.3}As layer 11 deposited on the buffer layer 17, this clearly suggests applicant's active layer because it is the same material claimed by applicant.

Referring to claims 9 and 21, the combination of Forrest et al and Dries et al teaches a capping layer of InAsP 31 (Fig 1B and col 7, ln 20-35).

Referring to claims 10 and 22, the limitation grown for electrical passivation is merely intended use. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The combination of Forrest et al and Dries et al teaches forming a capping layer thus meets the claimed invention.

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Referring to claim 11, the combination of Forrest et al and Dries et al teaches an active layer of $\text{In}_{0.7}\text{Ga}_{0.3}\text{As}$ and a step graded region with a buffer using InAsP.

Referring to claims 12 and 23, the combination of Forrest et al and Dries et al teaches vapor phase epitaxy (col 3, ln 1-5).

Referring to claims 24 and 28, the combination of Forrest et al and Dries et al teaches a compositionally graded step-graded region **21, 23, 25** terminated by a buffer layer **17**.

Referring to claim 27, the combination of Forrest et al and Dries et al teaches multiple layers between the buffer layers **19, 29, 27** and the active layer **13**, which meets the displacement layer limitation.

7. Claims 26 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest et al (US 5,518,934) in view of Dries et al (US 6,229,152) as applied to claims 1-25 and 27-29 above, and further in view of Chu et al (US 6,350,993).

The combination of Forrest et al and Dries et al teaches all of the limitations of claim 26, as discussed previously, except the buffer layer is a compositional overshoot which compensates for residual strain in the buffer layer such that the lattice constant in a growth plain matches that of the relaxed lattice constant of both the intermediate region and the active layer.

In a method of forming relaxed layers, note entire reference, Chu et al teaches an overshoot layer functions to ensure a high degree of relaxation for the surface layer at the interface (col 6, ln 1-20), this clearly suggests the buffer layer is a compositional overshoot which compensates for residual strain in the buffer layer such that the lattice constant in a growth

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plain matches that of the relaxed lattice constant of both the intermediate region and the active layer.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Forrest et al and Dries et al by using a compositional overshoot layer to ensure a high degree of relaxation, as taught by Chu et al.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Art Unit 1722


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MJS
September 14, 2007